

Amendment
Application No. 10/522,613
Attorney Docket No. 052070

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

Listing of Claims

Claim 1 (currently amended): A power unit for conveyance comprising:

a main power source and a standby ~~stand-by~~ power source, wherein a thermal battery is provided as the standby ~~stand-by~~ power source[.],

a backup power source connected to the main power source through a power supply wire;

a thermal battery ignition circuit for activating the thermal battery by electric power from the backup power source;

a voltage conversion circuit connected to the power supply wire, for allowing selectively either the voltage of the main power source to increase and to be supplied to the backup power source side, or the voltage of the backup power source side to decrease and to be supplied to the main power source;

a thermal battery ignition control circuit connected to the power supply wire between the main power source and the voltage conversion circuit to activate the thermal battery during operation, by controlling the thermal battery ignition circuit in response to voltage decrease of the main power source which operates by electric power from the power supply wire;

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a diagnosis circuit to diagnose for activation of the thermal battery, which is connected to the power supply wire between the main power source and the voltage conversion circuit and operates by electric power from the power supply wire;

a disconnection detection circuit which has a connection point between the main power source and the voltage conversion circuit, to detect disconnection of the power supply wire between the connection point and the main power source;

a voltage increase/decrease control circuit controlled by the disconnection detection circuit, for allowing the voltage conversion circuit to increase the voltage of the main power source side to supply to the backup power source side in a state such that disconnection of the power supply wire is not detected, and for allowing the voltage conversion circuit to decrease the voltage of the backup power source side to supply to the main power source side in a state such that disconnection of the power supply wire is detected; and

an operation stop control circuit to stop operation of the diagnosis circuit in response to detection of the power supply wire disconnection by the disconnection detection circuit.

Claim 2 (currently amended): The power unit for conveyance as set forth in claim 1, comprising:

a first switch means to conduct a switch operation by ~~[[for]]~~ detecting voltage of the main power source ~~to conduct a switch operation;~~

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an activation device to activate the thermal battery by [[for]] having continuity with the main power source when the ~~relevant~~ first switch means operates, ~~to activate the thermal battery~~;

a backup power source parallelly connected to the main power source through a diode;
and

a second switch means located between the ~~relevant~~ backup power source and the activation device, to switch ~~for switching~~ connection status between the backup power source and the activation device.

Claim 3 (currently amended): The power unit for conveyance as set forth in claim 1 comprising:

a first switch means to conduct a switch operation by [[for]] detecting voltage of the main power source ~~to conduct a switch operation~~;

a constant current circuit to which power is supplied from the main power source by a switch operation of the ~~relevant~~ switch, to supply ~~for supplying~~ constant current to the thermal battery; and

an energy storage means to supply ~~for supplying~~ backup power to the constant current circuit when power from the main power source is shut off.

Claim 4 (cancelled)

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Claim 5 (currently amended): The power unit for conveyance as set forth in claim 1 ~~[[4]]~~, wherein a resistance circuit is employed as the diagnosis circuit and a shutoff circuit is employed as the operation stop control circuit;

the resistance circuit is a circuit connected so that electric power is supplied from the above backup power source, to apply ~~for applying~~ a voltage between both ends of a part for activating the above thermal battery so as to diagnose the part for activating the above thermal battery; and

the shutoff circuit is a circuit to shut ~~for shutting~~ off electric power supply from the above backup power source to the resistance circuit in response to detection of the power supply wire disconnection by the above disconnection detection circuit.

Claim 6 (currently amended): The power unit for conveyance as set forth in claim 1, comprising:

a main power source abnormality detection means for detecting abnormality of the main power source;

an auxiliary power source means which is a power source means for supplying the thermal battery with electric power for starting ~~start to~~ the thermal battery, and is different from a battery located in the main power source; and

a control means for controlling so that electric power for starting ~~[[start]]~~ is supplied to the thermal battery ~~supply~~ from the auxiliary power source means to the thermal battery in case

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the main power source abnormality detection means detects abnormality of the main power source.

Claim 7 (currently amended): A power unit for conveyance, comprising:

a main power source and a standby power source, wherein a thermal battery is provided as the standby power source,

~~The power unit for conveyance as set forth in claim 1,~~ wherein the main power source is provided with a main storage battery whose negative electrode is grounded and a generator whose negative electrode is grounded, comprising: a first capacitor ~~condenser~~ whose positive electrode is connected to a positive electrode of the main storage battery and whose negative electrode is grounded; a second capacitor ~~condenser~~ whose positive electrode is connected to the positive electrode of the main storage battery through a positive electrode side current limiting resistor, and whose negative electrode is grounded through a negative electrode side current limiting resistor; a thermal battery activation circuit one of whose terminals is connected to the positive electrode of the main storage battery through a voltage sensor for detecting voltage decrease of the power source and closing to close electrically, and the other terminal is connected to the negative electrode of the second capacitor ~~condenser~~; a diode whose anode is connected to the other terminal of the thermal battery activation circuit, and whose cathode is connected to the positive electrode of the second capacitor ~~condenser~~; a main switch for grounding the positive

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electrode of the second capacitor ~~eondenser~~ when closing; and a control unit for closing the main switch by detecting voltage decrease of the main power source.

Claim 8 (currently amended): A power unit for conveyance, comprising:

a main power source and a standby power source, wherein a thermal battery is provided as the standby power source,

~~The power unit for conveyance as set forth in claim 1,~~ wherein the main power source is provided with a main storage battery whose negative electrode is grounded and a generator whose negative electrode is grounded, comprising: a DC-DC converter whose negative electrode is grounded, for increasing voltage of the main storage battery; a first capacitor ~~eondenser~~ whose positive electrode is connected to a positive electrode of the DC-DC converter, and whose negative electrode is grounded; a second capacitor ~~eondenser~~ whose positive electrode is connected to the positive electrode of the DC-DC converter through a positive electrode side current limiting resistor, and whose negative electrode is grounded through a negative electrode side current limiting resistor; a thermal battery activation circuit one of whose terminals is connected to the positive electrode of the DC-DC converter through a voltage sensor for detecting voltage decrease of the main power source and closing ~~to close~~ electrically, and the other terminal is connected to the negative electrode of the second capacitor ~~eondenser~~; a sub switch for grounding the other terminal of the thermal battery activation circuit through a diode for negative voltage protection, when closing; a main switch, which is the main switch[[,]] for

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grounding the positive electrode of the second ~~capacitor~~ condenser when the main switch closes; and a control unit for closing the sub switch when detecting voltage decrease of the main power source, and for closing the second switch in a prescribed amount of time after closing the main switch.

Claim 9 (currently amended): The power unit for conveyance as set forth in claim 1, wherein a circuit for limiting ignition electric current supplied ~~carried~~ to a thermal battery activation circuit for activating the thermal battery is provided; and

wherein the circuit for limiting ignition electric current comprises ~~comprising~~:

a semiconductor integrated circuit in which a thermal battery activation circuit ignition driving ~~drive~~ circuit is formed;

a reference power supply formed in the semiconductor integrated circuit;

a pull-down resistor connected to the outside of the semiconductor integrated circuit, to which electric current is supplied from the reference power supply; and

an electric current limitation circuit formed inside the semiconductor integrated circuit, the electric current limitation circuit ~~for~~ limiting a value of ignition electric current supplied ~~carried~~ to the thermal battery activation circuit within a predetermined range~~[[, with]]~~ based on a value of reference electric current supplied from the reference power supply to the pull-down resistor ~~as reference~~.

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Claim 10 (currently amended): The power unit for conveyance as set forth in claim 1,
wherein a circuit for limiting ignition electric current supplied ~~carried~~ to a thermal battery
activation circuit for activating the thermal battery is provided, and

the power unit for conveyance comprises in one semiconductor integrated circuit:

a thermal battery activation circuit ignition drive circuit[[,]] ;

an electric current detection resistor through which thermal battery activation
circuit ignition electric current flows[[,]] ;

a constant current source[[,]] ;

a pull-down resistor through which electric current from the constant current
source flows; and

an electric current limitation circuit for limiting ignition electric current value
detected based on potential difference between both ends of the electric current detection resistor
within a predetermined range based on potential difference between both ends of the pull-down
resistor, ~~are further provided in the same semiconductor integrated circuit.~~

Claim 11 (currently amended): The power unit for conveyance as set forth in claim 1,
wherein a circuit for limiting ignition electric current supplied ~~carried~~ to a thermal battery
activation circuit for activating the thermal battery is provided, and a semiconductor integrated
circuit in which a thermal battery activation circuit ignition drive circuit is formed and a time

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limitation means connected to outside of the semiconductor integrated circuit, for limiting current carrying time of ignition electric current to a predetermined time.

Claim 12 (original): The power unit for conveyance as set forth in claim 1, comprising:

a main power source abnormality detection means for detecting abnormality of the main power source; and

a sub power source means for supplying power to outside after abnormality is detected by the relevant main power source abnormality detection means.

Claim 13 (currently amended): The power unit for conveyance as set forth in claim 1, comprising:

a main power source abnormality detection means for detecting abnormality of the main power source;

a standby ~~stand-by~~ power source which is provided with a thermal battery for supplying power to outside when the main power source abnormality detection means detects power supply abnormality; and a standby ~~stand-by~~ power source abnormality detection means for detecting power supply abnormality in the relevant standby ~~stand-by~~ power source; and

a warning means for giving warning when abnormality in the standby ~~stand-by~~ power source is detected by the standby ~~stand-by~~ power source abnormality detection means at least either before or after the relevant conveyance starts.

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Claim 14 (currently amended): A conveyance comprising an electronic control system and the power unit for conveyances as set forth in claims 1,2,3,[[4,]] 5,6,7,8,9,10,11,12 or 13, which is constituted so that electric power for operating the electronic control system is supplied from the power unit for conveyance to the electronic control system.